REMARKS

Reconsideration and allowance of the above application are respectfully requested. As an initial matter, Applicants gratefully acknowledge the Examiner's allowance of Claims 63-70.

Claims 5-21 stand rejected under 35 USC 103(a) as allegedly being obvious over Murphy in view of either Payne alone or Payne in further view of Hong and Doriath, respectively. These contentions are respectfully traversed because the contended combinations based on these cited references fail to suggest each feature in Claims 5-21.

Claims 5-21 recite a "transverse" fiber device that includes an optical fiber and "a measurand surface adjacent to said second distal end of said fiber and ***parallel to said fiber core***" (emphasis added). In contrast, Murphy shows a reflecting surface 25 that is perpendicular to the fiber 14. Payne shows an angled fiber tip to send light out of the fiber and does not describe any mechanism for returning light from a surface into the fiber. As such, the Office Action fails to make a prima facie showing of obviousness of this feature over the combination of Murphy and Payne and the combinations of Murphy and Payne in view of Hong and Doriath. For this reason alone, Claims 5-21 are distinctly different from and thus are patentable over the cited prior art.

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In addition, Claims 5-21 recite the measurand surface to be "in a plane that intercepts with another plane defined by said end facet to form a line substantially perpendicular to said fiber core" and "is at least partially reflective to form an optical interferometer with said side fiber surface so that a first reflection of a beam produced at said side fiber surface interferes at said side fiber surface with a second reflection of the beam produced at said measurand surface." Nothing in the cited prior art references suggests these features. This further shows that Claims 5-21 are patentable over the cited prior art.

The "transverse" fiber devices recited in Claims 5-21 have a number of advantages in certain applications. The original specification provides the following beginning at the paragraph [0029]:

> *The transverse fiber interferometer 100 may be deployed in environments that have limited space or geometric constraints for receiving a sensing device. FIG. 2A shows one exemplary application of such a transverse fiber interferometer in a force-detected magnetic resonance spectrometer. A magnetized movable sample 201 or a movable sensing magnet 202 is located in a RF excitation coil 203 with a narrow gap between permanent magnets 210 and 212. The total magnetic field at the sample 201 is substantially homogeneous without a field gradient. The fiber probe 101 with the angled end surface 120 of the transverse fiber interferometer 100 can be inserted in various gaps between the magnets to measure the movement of either the sample 201 or the sensing magnet*

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202. Alternative to the magnet configuration for magnets 212 and 202, the magnet 212 may have a flat surface and the magnet 202 is placed above that flat surface with a gap therebetween. The fiber probe 101 can be inserted in this gap to measure the movement of the magnet 202.

In such an instrument, it would be difficult to deploy a conventional fiber interferometer, which couples light longitudinally along the fiber axis to a measurand surface because portions of the magnets would need be removed to allow insertion of a fiber probe parallel to the static magnetic field. Hence, the design and performance of this spectrometer may by detrimentally affected.

In this regard, the original specification further states,

Notably, since the fiber core 110 is essentially parallel to the measurand surface 130, the position of the second distal end 103 with angled end facet 120 can be externally modulated to oscillate perpendicular to its own axis. A positioning element may be used to control and modulate the position of the second end 103 relative to the measurand surface 130. In one implementation of the positioning element, one or more layers of piezoelectric material and electrodes may be deposited onto the surface of the second distal end 103 of the fiber 101 opposite from and parallel to the measurand surface 130 so that the fiber's distance from the measurand surface 130 may be adjusted or fed back without attachment of any extrinsic piezo actuators. This mechanism may provide a harmonic modulation of the light signal in addition to the modulation caused by the movement of the measurand surface 130. This could be utilized in applications where the fiber is itself driven in proportion to the quantity to be measured, or the fiber forms a mechanical element of the sensor. The reflective surface 130 external to the fiber 101 may in this case function as a point of reference for monitoring the change of position of the fiber probe. For example, the fiber may be used as a mechanical oscillator in a MEMS

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> *device or a force microscope. This modulation control of the fiber end can also be used to shift low-frequency or DC detected signals to higher frequencies in order to reduce noise. The fiber probe hence may be used to deliver a probe beam to a surface, modulate the return probe light in proportion to the measured quantity, and direct the modulated light to a receiver coupled to the first distal end 102 of the fiber 101.*

See, paragraphs [0031]. The original specification goes on to describe additional examples shown in FIG. 2B to illustrate additional advantages of such a transverse fiber device.

The cited Murphy, Payne, Hong and Doriath, however, are entirely silent on the transverse fiber devices and fail to recognize any technical issues associated with Murphy's devices. Based on lack of recognition of the issues addressed in the present application and lack of any specific suggestion of the transverse fiber devices as recited in Claims 5-21, Applicants respectfully submit that the disclosures of Murphy, Payne, Hong and Doriath fail to provide any motivation to make the combinations as contended in the Office Action. Therefore, the combinations in the Office Action are improper under 35 USC 103(a) and the rejections based on such combinations should be withdrawn.

Furthermore, based on the above analysis, it appears that the combinations in the Office Action are made based on

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hindsight with the benefit of the disclosure of the present application. This is impermissible under 35 USC 103(a).

In view of the above, Claims 5-21 are patentable. All rejections should be withdrawn.

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Respectfully submitted,

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